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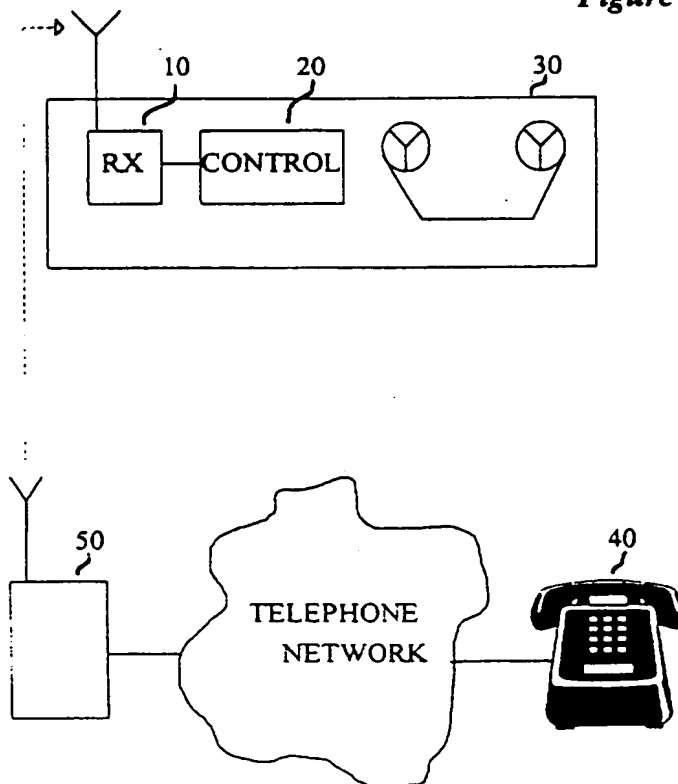
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GB 2268028 A GB 2258583 A GB 2230163 A
WO 94/13092 A1 WO 94/01963 A1 US 5337044 A
US 5276728 A US 4691341 A

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(54) A receiver device for enabling remote control of domestic equipment

(57) A device and a method whereby an absent person can control video recorder (30) or other equipment and systems according to an instruction or instructions transmitted to the device as a radio signal said radio signal being received and operated on by a public telecommunications network wireless signal receiver system such as a radio paging signal system receiver and decoder system (10), to produce an output signal to a control system (20) which facilitates the operation of the video recorder (30) or other equipment and systems to be controlled.

Figure 1



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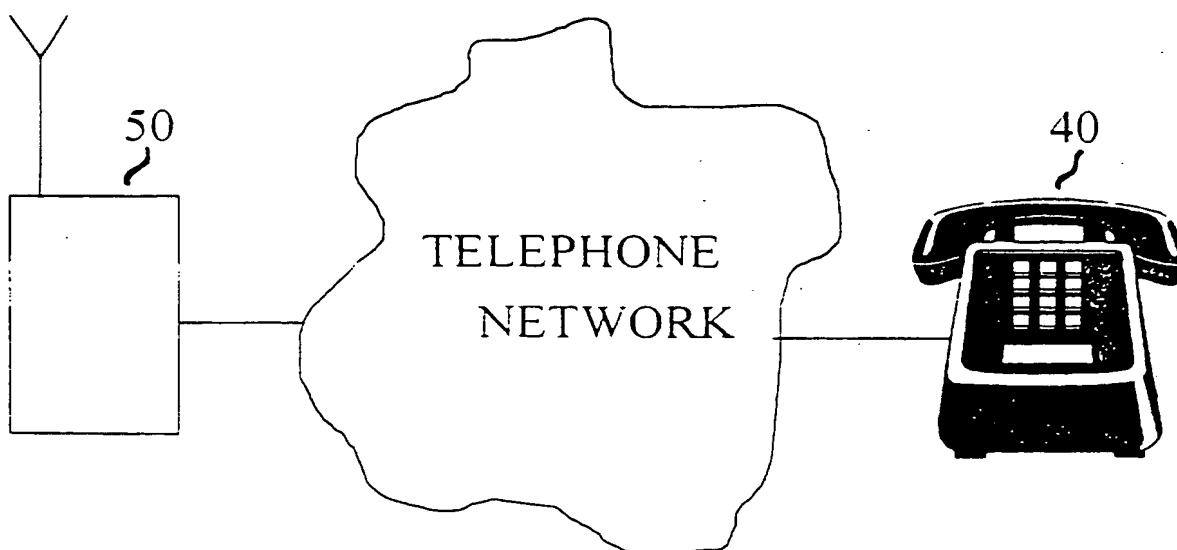
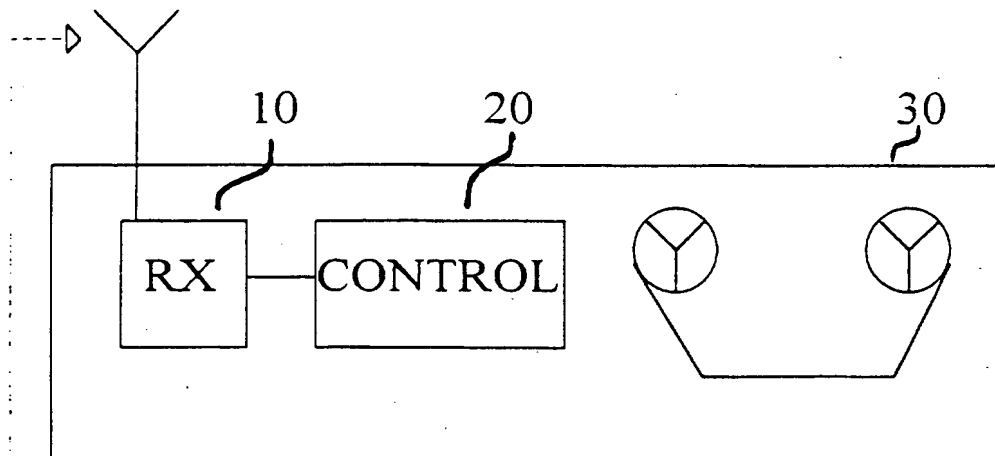
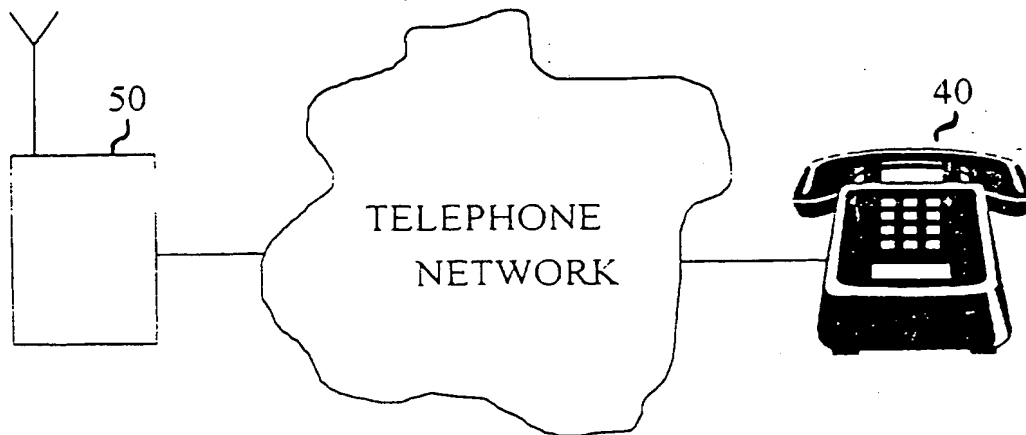
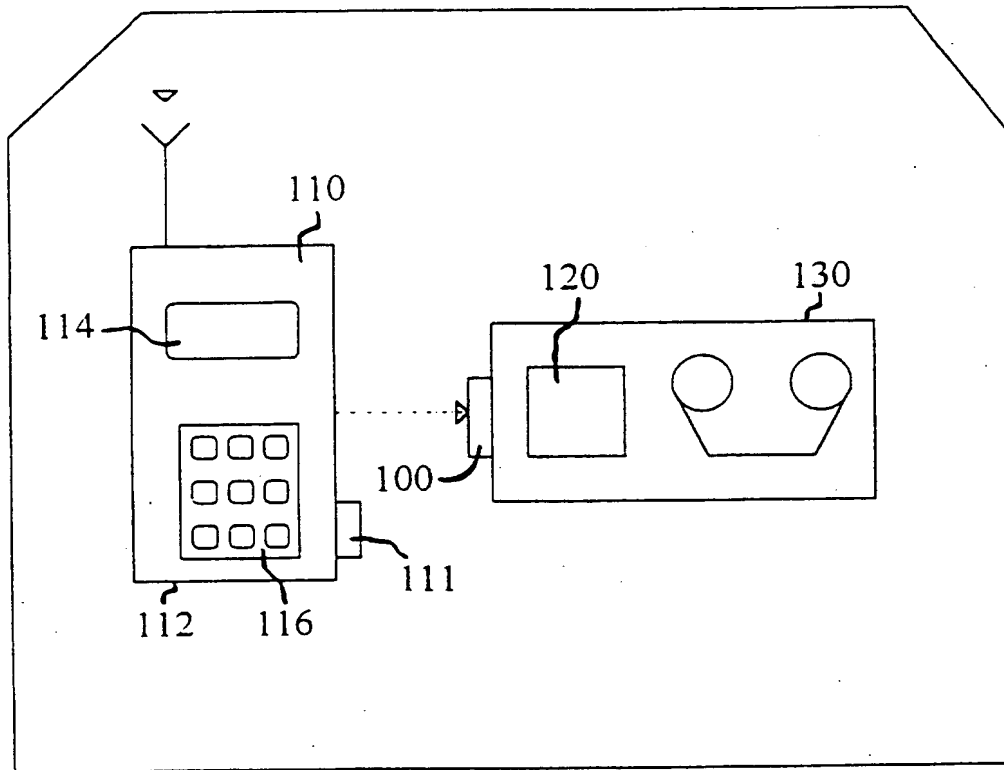
Figure 1

Figure 2

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PAGER		COMMAND ADDRESS		PAGER	
DURATION	CHANNEL	DATE	TIME	COMMAND	ADDRESS
030	01	250995	1830	RW	ADDRESS

FIGURE 3



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Figure 4

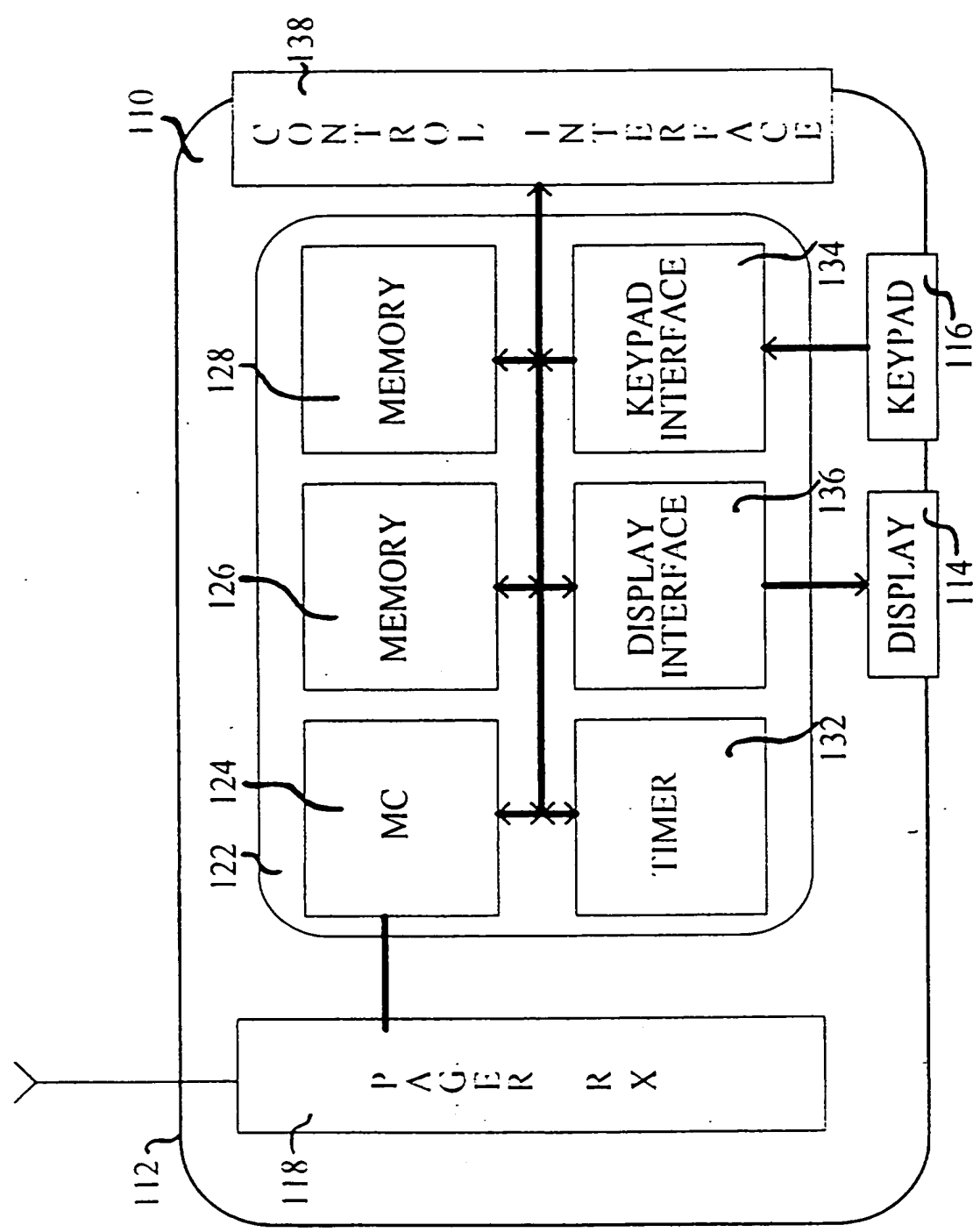
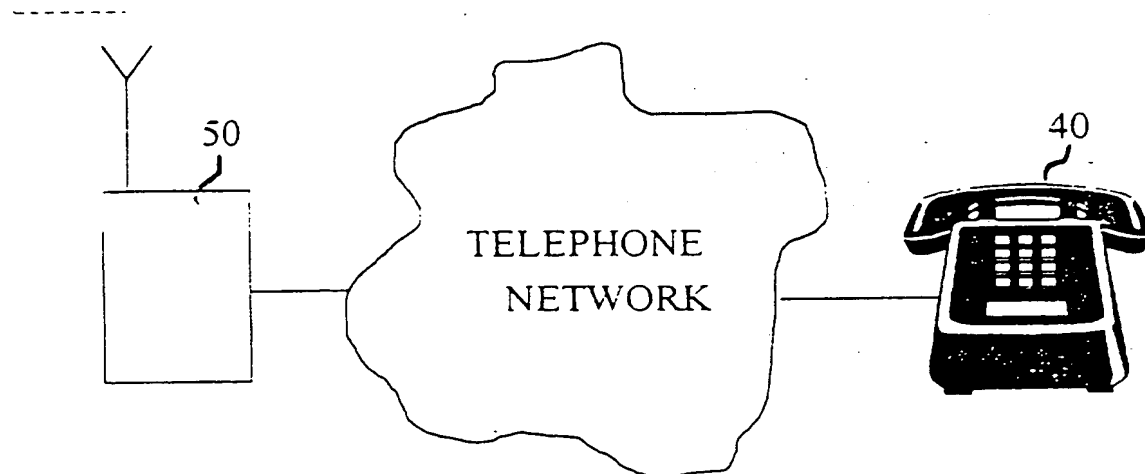
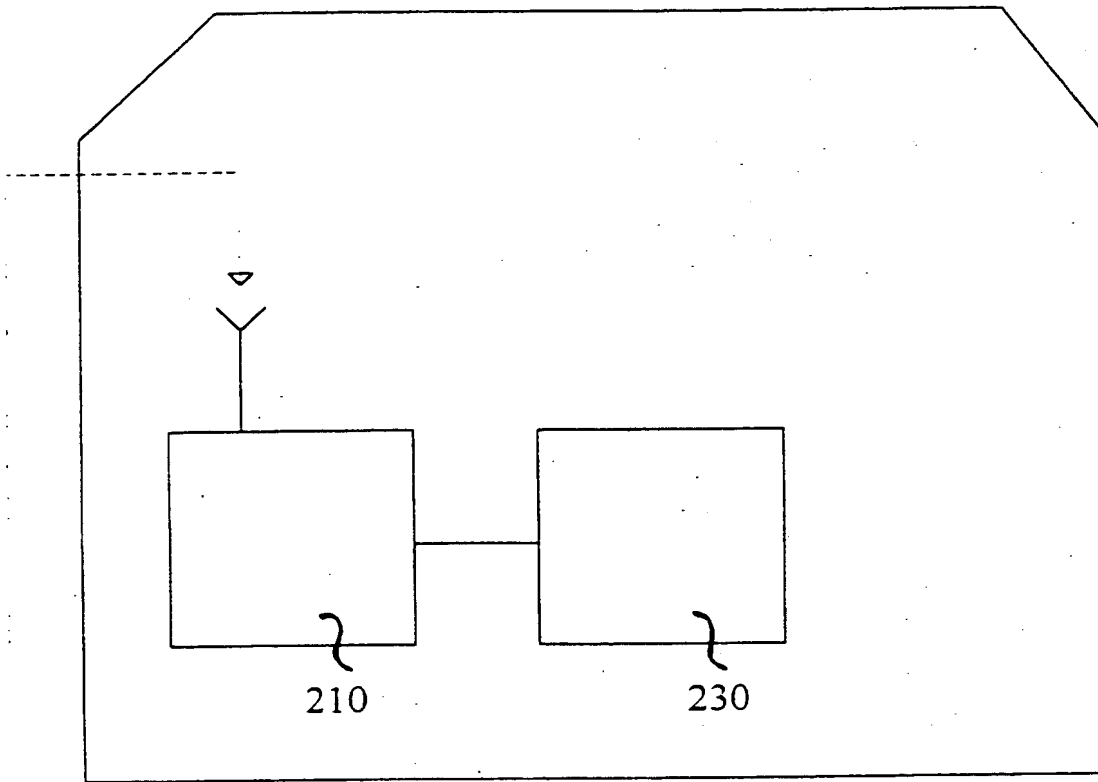
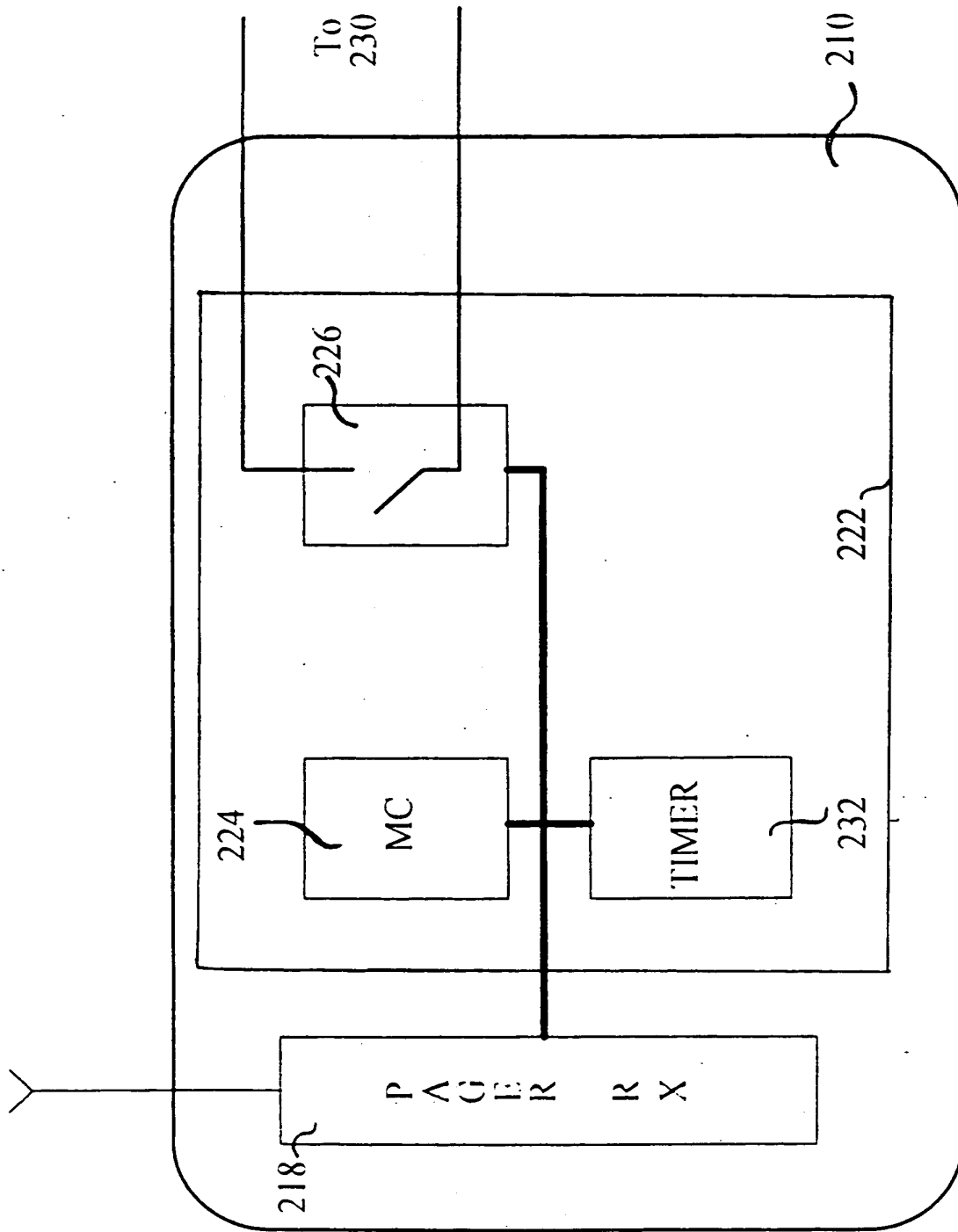


FIGURE 5



C/E

FIGURE 6



A Receiver Device For Enabling Remote Control Of Domestic Equipment

This relates to a device and method whereby an absent person can control the operation of a video recorder or other equipment and systems.

It is considered desirable to be able to control the operation of a video recorder or other equipment and systems in the absence of a person. For example, video recorders are often fitted with timer devices which permit the recording of one or more television programmes at pre-specified times. Also, in a domestic setting, timer devices are available which can be set to control the operation of hot water and central heating systems, lighting systems, or security alarm or surveillance systems at pre-specified times.

A disadvantage of control systems which rely on the use of a pre-set timer device is that they depend on a person knowing or anticipating in advance of leaving the equipment or system unattended the particular cycle of events and timings which that person wishes to control. Sometimes the person might simply forget to set the control system before leaving the equipment or system unattended. Sometimes the person might be unexpectedly prevented either from being able to operate the equipment or system, or from being able to set any timer device. For example, someone leaving his house to go on holiday can pre-set the timer device on his video recorder to record a particular television programme. If he forgets to set the video recorder timer device before he leaves then the programme will be missed. If the holidaymaker subsequently becomes aware of a programme which he might otherwise have wished to record he will be unable to operate his video recorder or set the video recorder timer device accordingly. Should the holidaymaker be late back from his holiday, he would also be unable to operate his

video recorder or set the video recorder timer device and would miss a programme which he had otherwise expected to see.

According to the present invention there is provided a device for controlling a video recorder or other equipment and systems according to an instruction or instructions transmitted to the device as a radio signal said radio signal being received and operated on by a public telecommunications network wireless signal receiver system to produce an output signal to a control system which facilitates the operation of the video recorder or other equipment and systems to be controlled.

A wireless link to the equipment or system to be controlled is particularly advantageous since it would remove any need to install a dedicated telephone land line to avoid any existing telephone land line link being made subordinate to the needs of the video recorder or other equipment and systems to be controlled. Also, the video recorder or other equipment and systems to be controlled could be then located in places where a telephone land line link would be inconvenient or impossible to achieve.

Radio paging systems are an established wireless link telecommunications technology within the public telecommunications network which allow a message or an alert to be sent to the user of a radio pager. Somebody wishing to send a message or an alert to the user of a radio pager communicates with a radio paging service provider, usually by telephone, who then transmits the message or alert as a radio signal to be received by the radio paging signal receiver and decoder system in the particular user's radio pager. In one method of operation for a radio pager which can display an alphanumeric message on a liquid crystal display screen, the radio paging signal system receiver and decoder system operates to process the radio signal representing that alphanumeric message to produce an output signal which causes a microcontroller to drive the liquid crystal

display screen to display the particular message.

One well known method used by radio paging service providers for transmitting messages as radio signals is to encode and transmit messages in POCSAG format. An example of a radio signal receiver and of a POCSAG decoder which can be combined in a radio paging signal receiver and decoder system which is able to produce an output signal to a microcontroller would be the UAA2080 and the PCF5001 manufactured by Philips Semiconductors.

A particular advantage of radio paging systems for present purposes is that radio paging services are already adapted to providing a short message facility which includes a wireless link and would be simple to use. A person seeking to use a device according to the present invention would not have to carry any specially adapted apparatus or device. The person simply needs to use a telephone (whether it be a public payphone, private telephone or radio mobile telephone) to call a radio paging service provider who then prepares and transmits the necessary instruction or instructions as a radio signal to the radio pager receiver system.

Other public telecommunications network wireless signal receiver systems, such as a mobile telephone receiver system, could be used as a wireless link to the device. In the absence of a message preparation and transmission service similar to that offered by a radio paging service provider, the person seeking to use a device which featured a mobile telephone receiver system would himself have to prepare and transmit an instruction or instructions to the device. This might be achieved by a "touch-tone" facility whereby an instruction could be sent using a telephone keypad, or by some specially adapted means. However, these alternatives to a radio pager signal receiver and decoder system are less preferred as they would be more complicated for the user and might require the user to

carry some specially adapted means.

Embodiments of the invention will now be illustrated, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a block diagram of a system including a first embodiment of the invention;

Figure 2 schematically illustrates a control message of the first embodiment ;

Figure 3 is a block diagram of a second embodiment of the invention;

Figure 4 is a block diagram showing the structure of a device of the second embodiment;

Figure 5 is block diagram of a system including a third embodiment of the invention;

Figure 6 is a block diagram showing the structure of a device of the third embodiment;

Referring to Figure 1, a device representing one embodiment of the present invention is achieved by integrating a public telecommunications network wireless signal receiver system (10), preferably a radio pager signal receiver and decoder system, with the control system (20) of a video recorder (30) when the video recorder (30) is manufactured. An instruction or instructions received as a radio signal by the radio pager signal receiver and decoder system (10) can then be output to the video recorder's control system (20). Where the video recorder's control system (20) includes a timer device, the instruction or instructions may cause the control system (20) to set the timer device so that the video recorder's control system (20) will operate the video recorder (30) according to the remainder of the instruction or instructions at the appropriate time.

A device so configured could operate in the following way. A person wishing to operate the unattended video recorder should first be familiar with the tuning of the video recorder television signal receiver. For example, channel 1 of the video recorder television signal receiver may already be tuned to BBC 1, channel 2 may already be tuned to receive BBC 2, channel 3 may already be tuned to receive ITV, and channel 4 may already be tuned to receive Channel 4. The person wishing to record a programme using the unattended video recorder would then telephone (40) the appropriate radio paging service provider (50) and ask them to send an instruction or instructions to the video recorder (30) so that it will record a particular programme. Having established the date, time, duration, and video recorder television signal receiver tuning for the broadcasting channel of the programme in question, the radio paging service provider (50) would encode this information as an instruction or instructions to be transmitted as a radio signal. The radio signal could also include other video recorder operating instructions such as an instruction to rewind to the beginning the tape currently in the video recorder (30).

By way of example, an instruction to rewind a tape to its beginning and then record a programme commencing at 6:30pm on 25th September 1995 on BBC 1 (where the video recorder television signal receiver channel for BBC 1 is 01) lasting 30 minutes could be represented alphanumerically as RW-1830-250995-01-030 (Figure 2). This instruction would then be transmitted as a radio signal in an appropriate format by the radio paging service provider (50) as any other alphanumeric message, and selectively received by the radio pager signal receiver and decoder system (10) where it would be converted into an electronic signal which when input to the video recorder's control system (20) would cause the video recorder (30) to record the programme in question. In this particular example of an alphanumeric instruction, the RW instruction would cause the video

recorder control system to rewind to its beginning the tape currently in the video recorder (30) and then set the video recorder's control system (20) timer so that the video recorder's control system (20) will operate the video recorder (30) according to the remainder of the instruction or instructions at the appropriate time.

Referring to Figure 3, a second embodiment of the invention is a device (110) to be used with an unmodified video recorder (130) (not fitted with a public telecommunications network wireless signal receiver system at manufacture) of the kind having a control system (120) which can receive an instruction or instructions from at least one interface port (100) arranged to be connected to an external source. One example of a video recorder control system (120) which can receive an instruction or instructions from an external source is one which responds to the typical video recorder infra-red emitter controller device in which case the port (100) is an infra-red receiver. Another example of such a video recorder control system (120) is one which can receive an electronic signal or signals via an input/output port (100) on the body of the video recorder (130). One such video recorder control system (120) would be one which responds to an electronic signal or signals according to Sony Corporation's Control L protocol.

Referring to Figures 3 and 4, in this second embodiment the device (110) has as its primary input means a public telecommunications network wireless signal receiver system, preferably a radio pager signal receiver and decoder system (118). The radio pager signal receiver and decoder system (118) acts to receive an instruction or instructions as a radio signal and operates on that radio signal to produce an output signal to a control system (122). The device also includes a body casing (112) comprised of an appropriate material, preferably plastic, an alphanumeric display (114), and a secondary input means (116). The alphanumeric display (114) may be, for example, a liquid crystal type display and the secondary input means (116) may be, for

example, a key pad.

The device in this second embodiment also comprises a control system (122) which will operate according to the instruction or instructions received as an output signal from the radio pager signal receiver and decoder system (118). Preferably, as shown in Figure 4, the receiver control system (122) will include at least a microcontroller (124), a memory system with temporary (128) and permanent (126) storage means, a timer system (132), an input link (134) from the secondary input means, an output link (136) to the display means, and at least one control signal output interface means (138) for the output of a control signal or signals to the control system of the video recorder (130). The microcontroller (124) would be programmed to respond to the output signal from the radio pager signal receiver and decoder system (118). The microcontroller (124) would then use the data in the memory system (126 and 128) to produce a control signal. The type of permanent data to be stored in the memory system (126) would include at least one software program or data appropriate to the control of the particular video recorder (130) to which the device is attached or linked. For instance, if the video recorder's control system is compatible with the Control L protocol, the appropriate software program or data in the permanent memory system (126) would enable the microcontroller (124) to output to the video recorder (130) a control signal or signals via the device's control signal output interface means (138) which carry an instruction or instructions in Control L format. The type of temporary data to be stored in the temporary memory system (128) would include details relating to how the device (110) has been set by the user to operate with the particular video recorder (130) selected.

The control signal output means (138) may be an electronic signal link which will connect with an appropriate control input/output socket (100) on the video recorder (130). Alternatively, or additionally, the control signal output means (138) might be an

infra red signal emitter system capable of communicating with the video recorder's internal control system's infra red signal receiver (100). As before, the instruction signal transmitted by the infra red signal emitter system (138) would be transmitted in a format ordered by the microcontroller using the appropriate software program or data stored in the device's control system's memory (126 and 128).

The device (110) in the second embodiment should be capable of standing independent of the video recorder (130), save for any connecting link or links which carry control signals between the device (110) and the video recorder where the two are connected by wired, rather than wireless, links. To achieve this, the device (110) may be powered by a battery, by mains power suitably adapted or by a rechargeable battery.

Alternatively, the device (110) may be capable of being closely attached to the video recorder (130). One method of attachment would be by a plug type fitting (111) forming part of the device casing (112) which could be inserted into an input/output socket on the video recorder (100). For example, if the video recorder is fitted with a Control L socket, the device body casing (112) may be fitted with an equivalent plug fitting (111) which will allow the device (110) to be mounted against the video recorder (130). Where the particular video recorder input/output socket (100) provides an appropriate source of electrical power, this source may be used to power the device as an alternative to any internal battery or mains electricity source.

A device (110) so configured would be used in the following way:

The device (110) would be prepared for use with a particular video recorder (130) by setting the device control system (122) to operate with the particular software program or data appropriate to the video recorder's control system (120). The control system

permanant memory (126) in a commercially produced device would be expected to include a suite of software programs or data appropriate to the variety of control systems to be found in different makes of video recorders. The device control system timer system (132) should then be synchronised with a standard time source to ensure that the device (110) will operate the video recorder (130) at the correct time. Also, the device (110) could include a facility whereby the particular video recorder television signal receiver channel settings for particular broadcasting channels which the video recorder is tuned to receive can be entered into the device's temporary memory (138). In contrast to the method of operation described in the first embodiment of the invention which required the user to be familiar with which video recorder television signal receiver channel setting was tuned to which broadcasting channel, this method means that the user notifies the radio paging service provider (50) of the name of the broadcaster of the programme to be recorded rather than the actual video recorder television signal receiver channel setting which needs to be selected. Thus the radio paging service provider (50) will be able to use a standard code for each broadcaster and the device's control system (122) will be able to convert that standard code to produce a control signal which will set the particular video recorder television signal receiver channel required. Referring to Figure 2, if the radio paging service provider (50) adopted 01 as its standard code for BBC 1, the device's control system (122) will be set to know which video recorder television signal receiver channel setting is required to receive BBC 1.

These setting-up procedures may be effected and confirmed through use of the keypad secondary input means (116) and the alpha-numeric display screen (114) with any such temporary data being stored in the temporary data memory (128).

The device (110) can then be connected to the video recorder (130)

If the plug type fitting (111) can also act as a control signal link to the video recorder input/output socket (100), such as a Control L input/output socket, then the plug type fitting can also be part of the device's control signal output interface (138) and there is no need for any further control signal link between the device (110) and the video recorder (130). If it is not possible to use the plug type fitting (111) as a control signal link to the video recorder input/output socket (100) then the device (110) can stand separate from the video recorder (130) save for a connecting cable from the device's control interface (138) to the video recorder input/output socket (100).

Alternatively, if no electrically conducting control signal link between the device (110) and the video recorder (130) can be effected, the control signal from the device (110) to the video recorder (130) can be transmitted to the infra red receiver (100) on the video recorder (130) by means of an infra red emitter system (138) driven by the device's control system (122). This infra red emitter system (138) might include a cable with an electrical or optical pathway. One end of the cable would be connected to the device (110) and the infra red signal would be emitted from the free end of the cable which would be positioned so that the infra red emission is directed at the video recorder's infra red receiver (100). Further, the infra red emitting end of the cable could be attached to a position on the video recorder so that the infra red emission will be output within the reception area of the video recorder's infra red receiver (100). One method of attaching the infra red emitting end of the cable to the video recorder (130) might be by some transparent adhesive method such as transparent adhesive glue, transparent adhesive tape or suction pad. The infra red emission link could then be kept as a semi-permanent fixture to the video recorder (130). To avoid unduly obstructing the video recorder's infra red receiver (100) should any person wish to use the video recorder's usual infra red control unit to control the video recorder in the normal way, the infra red emitting end of the cable might also be fitted with a semi-reflective mirror system which could be

attached to a position on the video recorder so that the infra red emission from the cable will be output and deflected to within the reception area of the video recorder's infra red receiver (100). Because the semi-reflective mirror system would also be part transparent it would also allow an emission from the video recorder's usual infra red control unit to the video recorder's infra red receiver (100) to pass through to the video recorder's infra red receiver (100) without undue obstruction.

Unlike a radio pager which usually has a relatively short radio signal receiving antennae within its body casing in order to be portable, the device (110) may have a longer external antennae if this is necessary to improve radio signal reception. If it is found that electrical emissions from the video recorder interfere with the device's ability to receive radio signals then the device (110) should be used separately from the video recorder (130). Any physical connecting link, such as a cable, between the device (110) and the appropriate control input/output socket (100) on the video recorder (130) should be appropriately long.

It should be part of the device (110) setting up procedure to set the selected control signal output means (138) using the secondary input means (116) and the visual display (114). Once set up, and while still under power, the device's control system (122) should retain for future use the device control system's timer system (132) setting, the selected control signal output means (138) and the selected software program or data including any settings which determine which video recorder television signal receiver channels receive which particular broadcasting network. Changes to the timer system (132), the selection of software program or data, or to the output means (138) can be effected via the secondary input keypad (116) if the device (110) is to be fitted to a different video recorder (130) from time to time.

A user can then activate the device's control system (122) by contacting the radio paging service provider in the manner already described above. The radio pager signal receiver and decoder system will receive the instruction or instructions prepared and sent as a radio signal by the radio paging service provider (50). The output signal from the radio pager signal receiver and decoder system (118) will then be input to the device's control system's microcontroller (124). Using the above example with the alphanumeric instruction RW-1830-250995-01-030 the microcontroller (124) in the device's control system (122) would respond to the RW element in the instruction by using the selected software program or data to produce a control signal which when transmitted to the video recorder's control system will cause the video recorder's control system (122) to rewind its tape to its beginning. The microcontroller (124) would then respond to the remainder of the instruction by setting the device's control system's timer system (132) so that at the appropriate time the microcontroller (124) will use the selected software program or data to produce a control signal which will cause the video recorder's control system (120) to record the user's selected programme broadcast on the user's selected channel during the user's selected time period.

The preferred method of operation for the device's control system (122) is that all control timings will be determined by the device's control system timing system (132) rather than use the control system (122) to produce a control signal which will set the video recorder's internal timer system. This helps to avoid any error over differences between the control system timer device (132) and the video recorder timer device. Further, it would be possible for the radio paging service provider (50) to include with the instruction or instructions sent as a radio signal a record of the current time so that the device's control system (122) can calibrate its own timing system (132) against the check time information in the instruction or instructions transmitted to the device (110) as a radio signal by the radio paging service provider (50).

Referring to Figures 5 and 6, another embodiment of the invention comprises a device (210) including a public telecommunications network wireless signal receiver system, preferably a radio pager signal receiver and decoder system (218), and a control system (222) in which the control system includes at least a switch mechanism (226), with or without a timer system (232) or a microcontroller (224). The device (210) can then be used to control the operation of a water heating system, a security lighting or security system, or any other equipment or system which it would be advantageous for an absent person to be able to control (230). For example, a person wishing to turn on their central heating system so their house was warm when they returned home could telephone their instructions to the radio pager service provider (50) who would then transmit the instruction or instructions as a radio signal to the radio pager signal receiver and decoder system (218). The output signal from the radio pager signal receiver and decoder would act to activate the control system switch which would turn on the heating system (230). Alternatively, the output signal from the radio pager signal receiver and decoder system (218) could set the control system timer device (232) so that the heating is switched on at a specified time.

Other control signal output means for the above embodiments could include an ultrasonic sound emitter or a radio signal transmitter.

Claims

- 1 A device for controlling domestic household equipment according to instructions transmitted to the device as a radio signal said radio signal being received and operated on by a public telecommunications network wireless signal receiver system to produce an output signal to a control system which facilitates the operation of the equipment or system to be controlled.
- 2 A device as in Claim 1 in which the control system includes one or more of the following:
 - (A) a timer device
 - (B) a switch mechanism
 - (C) a memory system
 - (D) a memory system which stores one or more software programs or data.
 - (E) a microcontroller
 - (F) a microcontroller programmed to use the one or more software programs or data stored in a memory system, said microcontroller acting according to an output signal to the control system from the public telecommunications network wireless signal receiver system, thereby enabling the control system to produce a control signal which facilitates the operation of the equipment or system to be controlled
- 3 A device as in Claim 1 or Claim 2 in which the control system has one or more of the following means by which to output a control signal which will facilitate the

operation of the equipment or system to be controlled.

- (A) an electrical conducting path
- (B) an infra red light signal emitter system
- (C) an infra red light signal emitter system which includes a fibre optic path
- (D) an ultrasonic sound emitter system
- (E) a radio signal transmitter system

- 4. A device as in Claims 1,2 or 3 in which the public telecommunications network wireless signal receiver system is a radio paging signal system receiver and decoder system
- 5. A device as in Claims 1,2,3 or 4 in which the equipment or system is one of the following
 - (A) a video recorder
 - (B) a water heating system
 - (C) a lighting system
 - (D) a security alarm or surveillance system
- 6. A device in accordance with any of the above claims which is integrated into the equipment or system to be controlled at manufacture
- 7. A method for controlling equipment or system whereby the control system which facilitates the operation of the equipment or system to be controlled acts in

accordance with a radio signal instruction or instructions received by a public telecommunications network wireless signal receiver

8. A method as in Claim 7 where the public telecommunications network wireless signal receiver system is a radio paging signal system receiver and decoder system
9. A method as in Claim 7 or Claim 8 where the equipment or system to be controlled is one of the following
 - (A) a video recorder
 - (B) a water heating system
 - (C) a lighting system
 - (D) a security alarm or surveillance system
10. The transmission of a radio signal to be received by any device or according to any method described in any of the preceding claims.
11. A receiver device for enabling remote control of domestic equipment having an equipment control device comprising:
 - a public telecommunications network wireless signal receiver system arranged to receive a radio signal carrying a digital control instruction;
 - and
 - an output means arranged to supply a corresponding equipment control instruction to said equipment control device.
12. A device according to Claim 11 in which said control signal is formatted as a

radio pager message which said receiver system is adapted to receive.

13. A device according to Claim 11 or Claim 12, in which said device is adapted to receive control instructions corresponding to tasks to be executed immediately by said equipment, and to supply corresponding equipment control instructions to said equipment control device for execution via said output means.
14. A device according to Claims 11, 12 or 13, in which said device is adapted to receive control instructions corresponding to tasks to be executed at a predetermined substantially later time.
15. A device according to Claim 14 further comprising a timer, and control means for setting said timer to give out a timer signal at said later time, and for supplying equipment control instructions to said equipment via said output means in response to said timer signal.
16. A device according to Claim 14 for use with equipment in which said control device comprises a programmable timer, comprising means for generating equipment programming instructions, for programming said timer, in response to said control instructions, via said output means.
17. A device according to Claims 11, 12, 13 14, 15 or 16 comprising a store for storing a plurality of different sets of equipment control instructions, respectively corresponding to a plurality of different equipment types.
18. A device according to Claims 11, 12, 13 14, 15, 16 or 17 provided in a common housing with said equipment, said output means being wired to said equipment

control device.

19. A device according to any of Claims 11 to 18 in which said output means communicates with said equipment control device via a cordless transmission link.
20. A device according to any Claims 11 to 19, where said equipment is a video recorder

Patents Act 1977

**Examiner's report to the Comptroller under Section 17
(The Search report)**

19

Application number
GB 9519624.2

Relevant Technical Fields

(i) UK Cl (Ed.N) H4K: KOE; K0F. H4L: LDA.

(ii) Int Cl (Ed.6) H04M. H04Q

Search Examiner
AL STRAYTON

Date of completion of Search
22 NOVEMBER 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
ALL

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Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2268028 A	(HASHIMOTO) Entire document	5, 9, 20
X, Y	GB 2258583 A	(GEC-FERRANTI) page 8, final paragraph	All
Y	GB 2230163 A	(MACKENZIE) Entire document	5, 9
X, Y	WO 94/13092 A1	(AUMEC) page 1, line 24 - page 3 line 8; see the Figures	all
X, Y	WO 94/01963 A1	(ROZGONY) page 10, lines 13-26	All
X, Y	US 5337044	(FOLGER) column 5, line 1 - column 6 line 2	All
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